# Errata to "A Comparison of Methods for Multiclass Support Vector Machines"

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In the above paper,[1] the following corrections are noted.

Equation (4) should be

$$\min_{w,b,\xi} \quad \frac{1}{2}\sum_{m=1}^{k} w_m^T w_m + C\sum_{i=1}^{l}\sum_{m\neq y_i}\xi_i^m$$

subject to

$$w_{y_i}^T\phi(x_i) + b_{y_i} \geq w_m^T\phi(x_i) + b_m + 2 - \xi_i^m$$
$$\xi_i^m \geq 0, i = 1,\ldots,l,\ m \in \{1,\ldots,k\}\backslash y_i. \tag{4}$$

Equation (5a) should be

$$\min_{\alpha} \quad \sum_{i,j}(\frac{1}{2}c_j^{y_i}A_iA_j - \sum_m \alpha_i^m\alpha_j^{y_i} + \frac{1}{2}\sum_m \alpha_i^m\alpha_j^m)K_{i,j} - 2\sum_{i,m}\alpha_i^m$$

subject to

$$\sum_{i=1}^{l}\alpha_i^m = \sum_{i=1}^{l}c_i^m A_i, m = 1,\ldots,k$$
$$0 \leq \alpha_i^m \leq C,\ \alpha_i^{y_i} = 0$$
$$A_i = \sum_{m=1}^{k}\alpha_i^m,\ c_j^{y_i} = \begin{matrix} 1 & \text{if } y_i = y_j \\ 0 & \text{if } y_i \neq y_j \end{matrix}$$
$$= 1,\ldots,l, m = 1,\ldots,k. \tag{5a}$$

Equation (7a) should be

$$\min_{w,b,\xi} \quad \frac{1}{2}\sum_{o<m}^{k}\|w_m - w_o\|^2 + C\sum_{i=1}^{l}\sum_{m\neq y_i}\xi_i^m$$

subject to

$$w_{y_i}^T\phi(x_i) + b_{y_i} \geq w_m^T\phi(x_i) + b_m + 2 - \xi_i^m$$
$$\sum_{m=1}^{k} w_m = 0$$
$$\xi_i^m \geq 0, i = 1,\ldots,l,\ m \in \{1,\ldots,k\}\backslash y_i. \tag{7a}$$

Equation (9) should be

$$\min_{w,b,\xi} \quad \frac{1}{2}\sum_{m=1}^{k} \begin{matrix} w_m^T & b_m \end{matrix} \begin{matrix} w_m \\ b_m \end{matrix} + C\sum_{i=1}^{l}\sum_{m\neq y_i}\xi_i^m$$

subject to

$$\begin{matrix} w_{y_i}^T & b_{y_i} \end{matrix} \begin{matrix} \phi(x_i) \\ 1 \end{matrix} \geq \begin{matrix} w_m^T & b_m \end{matrix} \begin{matrix} \phi(x_i) \\ 1 \end{matrix} + 2 - \xi_i^m$$
$$\xi_i^m \geq 0, i = 1,\ldots,l, m \in \{1,\ldots,k\}\backslash y_i. \tag{9}$$

Equation (13) should be

$$\min_{d} \quad \nabla f(\alpha)^T d$$

subject to

$$-1 \leq d \leq 1$$
$$d_i^m \geq 0,\ \text{if } \alpha_i^m = 0,\ d_i^m \leq 0,\ \text{if } \alpha_i^m = C. \tag{13}$$

Equation (16) should be

$$\min_{w_m,\xi_i} \quad \frac{1}{2}\sum_{m=1}^{k} w_m^T w_m + C\sum_{i=1}^{l}\xi_i$$

subject to

$$w_{y_i}^T\phi(x_i) - w_m^T\phi(x_i) \geq e_i^m - \xi_i, i = 1,\ldots,l. \tag{16}$$

Equation (17a) should be

$$\min_{\alpha} \quad f(\alpha) = \frac{1}{2}\sum_{i=1}^{l}\sum_{j=1}^{l}K_{i,j}\bar{\alpha}_i^T\bar{\alpha}_j + \sum_{i=1}^{l}\bar{\alpha}_i^T\bar{e}_i$$

subject to

$$\sum_{m=1}^{k}\alpha_i^m = 0, i = 1,\ldots,l$$
$$\alpha_i^m \leq 0 \text{ if } y_i \neq m$$
$$\alpha_i^m \leq C,\ \text{if } y_i = m$$
$$i = 1,\ldots,l, m = 1,\ldots,k. \tag{17a}$$

Equation (18) should be

$$\min \quad \frac{1}{2}A\bar{\alpha}_i^T\bar{\alpha}_i + B^T\bar{\alpha}_i$$

subject to

$$\sum_{m=1}^{k}\alpha_i^m = 0$$
$$\alpha_i^m \leq C_{y_i}^m, m = 1,\ldots,k. \tag{18}$$

Equation (23) should be

$$\min \quad \frac{1}{2}\sum_{m=1}^{k} w_m^T w_m + C\sum_{i=1}^{l}\xi_i$$

subject to

$$(w_{y_i}^T\phi(x_i) + b_{y_i}) - (w_m^T\phi(x_i) + b_m) \geq e_i^m - \xi_i, i = 1,\ldots,l. \tag{23}$$

Manuscript received July 2, 2002.
Publisher Item Identifier S 1045-9227(02)06112-X.

[1] C.-W. Hsu and C.-J. Lin, *IEEE Trans. Neural Networks*, vol. 13, pp. 415–425, Mar. 2002.

Equation (24) should be

$$\min f(\alpha) = \frac{1}{2}\sum_{i=1}^{l}\sum_{j=1}^{l}(K_{i,j}+1)\bar{\alpha}_i^T\bar{\alpha}_j + \sum_{i=1}^{l}\bar{\alpha}_i^T\bar{e}_i$$

subject to

$$\begin{aligned} &\sum_{m=1}^{k}\alpha_i^m = 0\\ &\alpha_i^m \leq 0 \text{ if } y_i \neq m\\ &\alpha_i^m \leq C, \text{ if } y_i = m\\ &i = 1,\ldots,l, m = 1,\ldots,k. \end{aligned} \tag{24}$$